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ASSESSMENT

Clinicians can use fast and inexpensive screening tests to identify children who need a referral for specialized vestibular testing.

ARTICLE

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Part II: Pediatric Vestibular Disorders

Clinical & Diagnostic Assessment

By Kristen Janky, AuD, PhD, Jennifer Braswell-Christy, PT, PhD, FAPTA and Rose-Marie Rine, PT, PhD

The vestibular system is responsible for balance, gaze stability, and spatial orientation. Vestibular dysfunction affects approximately 5.3% of U.S. children ages 3–17, yet only 29.9% of those affected received treatment. Early identification is critical: untreated vestibular loss leads to progressive delays in gross motor development, reading, and school performance.

WHO IS AT RISK?

- Severe-to-profound sensorineural hearing loss or cochlear implants
- Congenital cytomegalovirus (CMV)
- Meningitis or temporal bone fracture
- Enlarged vestibular aqueduct syndrome
- Auditory neuropathy spectrum disorder (ANSD)
- Pediatric migraine
- Traumatic brain injury or concussion
- Chronic otitis media (ear infection)

Vestibular rehabilitation has been shown to improve balance, reduce motor delays, and increase visual stability in children with vestibular dysfunction.

QUESTIONNAIRES

Questionnaires gather information about symptom onset, functional impact, and developmental history and can be completed by the child, parent, or caregiver prior to the clinical visit.

- Case History – Onset, timing, severity of dizziness; developmental milestones (sitting, walking, bike riding); school performance; co-morbidities (hearing loss, concussion, headache).
- Pediatric Vestibular Symptom Questionnaire (PVSQ) – Validated 10-item self-report for ages 6–17 years. Score ≥0.68 (out of 3) discriminates vestibular symptoms (Sensitivity: 95%, Specificity: 85%). Available in multiple languages.
- Vanderbilt Pediatric Dizziness Handicap Inventory for Caregivers

(DHI-PC) – Parent-reported measure quantifying severity and functional impact of vestibular impairments in children ages 5–12 years.

- Canadian Occupational Performance Measure (COPM) – Identifies and measures perceived performance and satisfaction with self-identified functional problems.
- Convergence Insufficiency Symptom Survey (CISS) / SCAT – Useful for children with concussion or visual symptoms associated with vestibular dysfunction.

CLINICAL SCREENING TESTS

The following tests are fast, require minimal equipment, and can be completed in most clinical settings. Children who fail any portion of the screen should be referred for formal vestibular function testing.

Vision & Oculomotor Screening (5–10 minutes)

- Smooth Pursuit – Child follows a finger puppet moving slowly horizontally and vertically; clinician watches for smooth, accurate tracking.
- Saccades – Child rapidly looks from one target to another; clinician assesses quickness and accuracy.
- Ocular Alignment – Cover/cross-cover test to identify skew deviation or strabismus.
- Convergence – Target moved toward the nose; eyes should converge to within 6 cm.
- Visual Acuity – Assessed using LEA Symbols or Snellen chart. Refer if worse than 20/30.

Abnormal findings should prompt referral to a pediatric optometrist or neurologist.

Peripheral Vestibular Screening

- Head Impulse Test (HIT) – Child focuses on examiner's nose while examiner delivers rapid, high-acceleration head impulses left and right. A corrective saccade (catch-up eye movement) indicates poor VOR function. Sensitivity: 75%, Specificity: 91%. Can be used from 6 months of age.
- Modified Emory Clinical Vestibular Chair Test (mECVCT) – Child sits in a rotating office chair with eyes closed, rotated at 0.5 Hz for 30 seconds each direction. Nystagmus duration recorded with vision-occluding goggles after stopping. Total <29.2 seconds suggests vestibular dysfunction (Sensitivity: 63%, Specificity: 100%). Useful when formal rotary chair is unavailable.
- Clinical Dynamic Visual Acuity Test (DVA) – Visual acuity assessed with head still vs. head moving at 2 Hz. A decrease of >2 lines indicates VOR dysfunction (Sensitivity: 88%, Specificity: 69%). Feasible from age 3 years.
- Vibration-Induced Nystagmus Test (VINT) – 100 Hz vibration applied to the mastoid (VINT) for 10 seconds with vision occluded. Presence of nystagmus indicates unilateral vestibular dysfunction. In children ages 5–18: Sensitivity: 86%, Specificity: 96%. Note: VINT will be absent in bilateral vestibular loss.
- Subjective Visual Vertical (SVV – Bucket Test) – Child looks into an opaque bucket and reports when a line appears vertical. Children ≥6 years should be within 2.5 degrees of true vertical (ICC=0.74). Sensitivity/specificity not yet established in pediatric populations. Children with concussion and Cerebral palsy have increased variance of trials.

Balance Assessment

- Modified Clinical Test of Sensory Interaction on Balance (mCTSIB) – Child stands barefoot, feet together, arms across chest for up to 30 sec under 4 conditions: (1) Eyes open, stable floor; (2) Eyes closed, stable floor; (3) Eyes open, foam; (4) Eyes closed, foam. Conditions are summed (max 120 sec). Score <110 sec suggests vestibular dysfunction. Sensitivity: 88%, Specificity: 85%, ICC=0.74, MDC_{90}=16.75 sec.
- mCTSIB Age-Based Normative Expectations
- (insert table)
- Single Leg Stance (SLS) – Child stands on one leg, hands on hips, shoes off, knee bent

~90°. Six trials (3 per leg), eyes open then eyes closed. Best trial recorded per condition. Cutoff of 4 sec (eyes closed) predicts vestibular loss (Sensitivity: 90%, Specificity: 84%). Normative values: 5 sec by age 7, 15 sec by age 9, 30 sec by age 11.

- Functional Gait Assessment Modified for Children (FGA-mC) — 10-item gait assessment

QUICK REFERENCE: CLINICAL SCREENING TESTS

Test	Age Range	Approx. Time	Key Cutoff	What It Detects
Head Impulse Test (HIT)	6 mo+	2–3 min	Corrective saccade	Peripheral VOR
DVA (Dynamic Visual Acuity)	3 yr+	5 min	>2 line decrease	VOR / Gaze instability
VINT	5–18 yr	5 min	Nystagmus present	Unilateral vestibular loss
mECVCT	Any age	10 min	<29.2 sec total	Canal function (no equipment)
mCTSIB	3 yr+	10 min	<110 sec	Sensory integration / balance
Single Leg Stance	4 yr+	5 min	<4 sec EC	Vestibular balance
FGA-mC	4 yr+	10 min	<26	Dynamic gait / vestibular
Ghent Developmental Balance Walk	5 yr 11 mo	15 min	z-score	Infant/toddler balance
PBS / PBS-2	2–15 yr	15 min	Below age norms	Functional balance
PDMS-3	Birth–5 yr 11 mo	20–30 min	Below age norms	Gross/fine motor development
BOT-3 Balance	4–26 yr	15–20 min	<27.5	Motor proficiency / balance

scored 0–3 per item (max 30). Includes: level walking, head turns during gait, pivot turns, stepping over obstacles, narrow base, backward walking, eyes-closed walking, and stairs. Score <26 identifies vestibular loss (Sensitivity: 67%, Specificity: 84%). Children with vestibular hypofunction struggle most with: horizontal head turns during walking, tandem gait, and eyes-closed walking.

- Pediatric Balance Scale (PBS / PBS-2) — 14-item functional balance assessment for ages 2–15+ years (max 56 points). PBS-2 adds 6 more items for higher ceiling. Excellent reliability: test-retest ICC=0.998, interrater ICC=0.997, MDC ≈ 3.9–4.7 points.
- Ghent Developmental Balance Test (GDBT) — For children from independent walking through 5 years, 11 months. Developmentally

ordered static and dynamic balance items. Scores convert to z-scores. Excellent reliability: test-retest ICC=0.99, interrater ICC=0.98. Distinguishes children with and without vestibular dysfunction. Ideal for infants too young for mCTSIB or FGA-mC.

Motor Development

- Motor development is frequently delayed in children with vestibular dysfunction. Assessment of developmental milestones should be part of every evaluation.
- Gross Motor Milestones — Independent sitting after 7.25 months (Sensitivity: 62%, Specificity: 81%) or independent walking after 14.5 months (Sensitivity: 78%, Specificity: 77%) indicates increased risk. Refer for evaluation.
- Peabody Developmental Motor Scales, 3rd Edition (PDMS-3) — Standardized assessment for birth through 5 years, 11 months. Includes Body Control, Body Transport, Object Control, Hand Manipulation, and Eye-Hand Coordination subtests. Norms based on 1,452 children (2016–2021). Replaces PDMS-2; online scoring required.
- Bruininks-Oseretsky Test of Motor Proficiency, 3rd Edition (BOT-3) — Standardized motor assessment for ages 4–26 years. Balance subtest (9 items + head turns; Extended Balance adds 5 beam items) is particularly useful. Score <27.5 on balance subtest using BOT-2 indicates vestibular dysfunction (Sensitivity: 88%, Specificity: 88%). Provides scaled scores, age equivalents, and Growth Scale Values.

DIAGNOSTIC & FUNCTION TESTS

When a child fails clinical screening or presents with gross motor delay or dizziness, referral for formal vestibular function testing is recommended. Testing can begin in infants as young as a few days old. The American Academy of Audiology (2025) and International Pediatric Otolaryngology Group (2025) have published consensus guidelines for pediatric vestibular testing.

Ages 0–3 Years

- Cervical VEMP (cVEMP) — Assesses saccule (otolith) function. Electrodes on neck; child lifts/turns head while listening to clicking sounds. Feasible from birth. Recommended as first-tier screen in infants — particularly those with sensorineural hearing loss. Can use same equipment as ABR. Under 12 months: cVEMP (bone-conducted) is the most successful vestibular test.
- Remote-Camera Video Head Impulse Test (RC-vHIT) — Child sits on parent's lap facing a remote camera that records eye movements during head movements. Assesses all semicircular canals. Feasible from 6 months. Success rate >90% by 12 months.
- Rotary Chair — Motorized chair assesses horizontal canal function across multiple frequencies. Child may sit in car seat or on parent's lap. Feasible from birth. Most valuable when other tests are not tolerated.

Ages 3–7 Years

- Video Head Impulse Test (vHIT) — Lightweight goggles with embedded camera assess all 6 semicircular canals. Gain <0.8 (or <0.7 for young children) or corrective saccades indicate dysfunction. Completed in 10–15 minutes. Does not induce dizziness. No impact from middle ear status.
- Ocular VEMP (oVEMP) — Assesses utricle (otolith) function. Electrodes under eyes; child looks upward during clicking sounds. Not reliably present until ~4 years of age.
- Rotary Chair and cVEMP — Continued from earlier ages.

Ages 7+ Years

- All of the above, plus: —
- Caloric Testing — Warm and cool water (or air) placed in each ear while child lies with head at 30°. Eye movements recorded with goggles. Provides low-frequency, ear-specific information. Best test for detecting mild unilateral vestibular loss. Routine use not recommended until age 6–7 due to cooperation requirements.

CLINICAL RECOMMENDATION

Beginning at 6 months, screen all children with severe-to-profound hearing loss, ANSD, hearing loss from meningitis or CMV, or any hearing loss with gross motor delay. Screening should include RC-vHIT, bone-conducted cVEMP, and/or rotary chair. Children who fail should receive a physical therapy evaluation and follow-up vestibular assessment at ages 3–4 years.

CONCLUSION

Clinicians can use fast, inexpensive screening tests to determine whether a child should be referred to a specialist for formal vestibular function testing. Early detection allows early intervention, preventing progressive developmental delays. The next article in this series outlines evidence-based interventions for treating gaze instability, motor, and balance impairments in children with vestibular dysfunction.

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